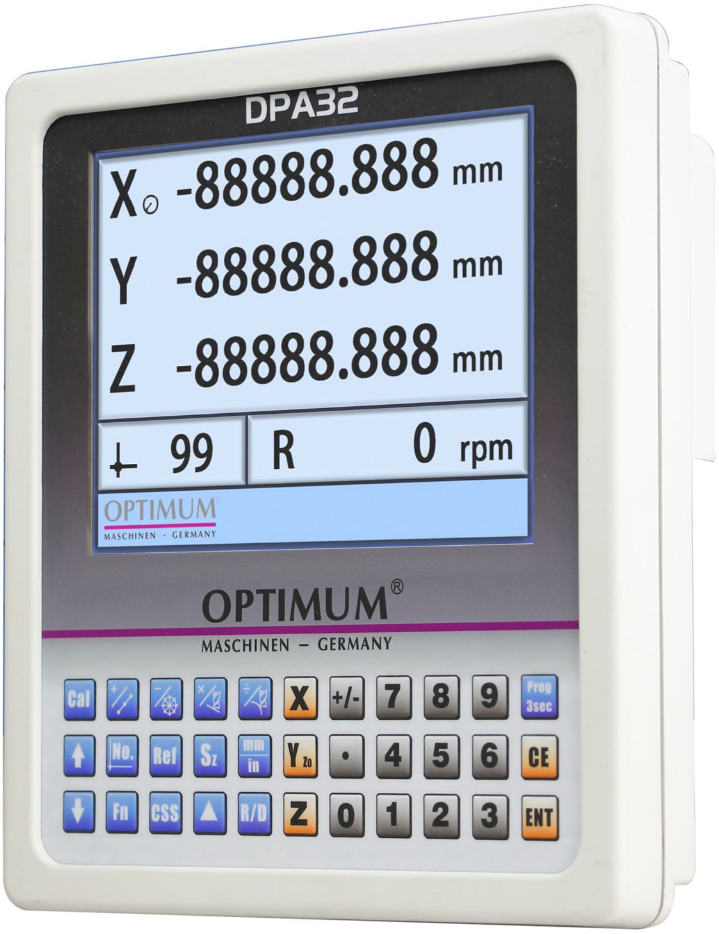
User manual

Digital readout

DPA 32

Item no. 03403027DPA32
3384033

Version: 1.3.2



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Preface

Dear customer,

Thank you very much for purchasing a product made by OPTIMUM.

OPTIMUM metal working machines offer a maximum of quality, technically optimum solutions and convince by an outstanding price performance ratio. Continuous enhancements and product innovations guarantee state-of-the-art products and safety at any time.

Before commissioning please thoroughly read these operating instructions and get familiar with the device. Please also make sure that all persons operating the device have read and understood the operating instructions beforehand.
Keep these operating instructions in a safe place nearby the machine.

Information

The operating instructions include indications for safety-relevant and proper installation, operation and maintenance of the device. The continuous observance of all notes included in this manual guarantee the safety of persons and of the machine.

The manual determines the intended use of the device and includes all necessary information for its economic operation as well as its long service life.

The illustration and information included in the present manual can possibly deviate from the current state of construction of your device. Being the manufacturer we are continuously seeking for improvements and renewal of the products. Therefore, changes might be performed without prior notice. The illustrations of the device may be different from the illustrations in these instructions with regard to a few details. However, this does not have any influence on the operability.
Therefore, no claims may be derived from the indications and descriptions. Changes and errors are reserved!

Your suggestion with regard to these operating instructions are an important contribution to optimising our work which we offer to our customers. For any questions or suggestions for improvement, please do not hesitate to contact our service department.

If you have any further questions after reading these operating instructions and you are not able to solve your problem with a help of these operating instructions, please contact your specialised dealer or directly the company OPTIMUM.

Optimum Maschinen Germany GmbH
Dr.- Robert - Pfleger - Str. 26
D-96103 Hallstadt
Fax (+49)0951 / 96555 - 888
Email: info@optimum-maschinen.de
Internet: www.optimum-machines.com

1 DPA32 with function of constant cutting speed

1.1 Safety

1.2 Safety instructions

1.2.1 Safety and warranty informations

- In order to carry out installation correctly, we strongly recommend this document is read very carefully. For your own safety and operational safety, observe all warnings and instructions.
- Your device has been quality controlled, tested and is ready for use. Please respect all warnings and information which are marked either directly on the device or in this document.
- Warranty can only be claimed for components supplied by Optimum Maschinen Germany GmbH. If the DRO is used together with other products, the warranty for the complete system is invalid.
- Repairs should be carried out only at our works. For further questions please contact Optimum Maschinen Germany GmbH.

1.3 Intended use

Combined with external sensors, the DRO represents a high-precision measuring system. The electronic display serves exclusively for processing and indicating position and rotational speed values.

Observe all safety instructions contained herein.

- Arbitrary modifications and changes to this electronic display are forbidden.
- Observe the prescribed operating and installation conditions.
- Operate the electronic display exclusively within the technical data and the specified limits.

1.4 Identification of danger and notes

Safety notes consist of a signal sign and a signal word.

1.4.1 Danger classes

Symbol	Alarm expression	Definition / consequence
⚠	**DANGER!**	Immediate danger that may cause irreversible bodily harm resulting in death, property damage or unplanned device reactions if you disregard the instructions given.
	WARNING!	Danger that may cause irreversible bodily harm, property damage or unplanned device reactions if you disregard the instructions given.
	CAUTION!	Danger that may cause minor injury, property damage or unplanned device reactions if you disregard the instructions given.
✋	**ATTENTION!**	Important operating information that may facilitate operation or cause unplanned device reactions if disregarded including possible property damage.
ℹ	**INFORMATION**	Application tips and other important or useful information and advice. No dangerous or harmful consequences for people or objects.

1.5 Target group

The installation instructions are intended for the project planning, commissioning and installation personnel of plant or machine manufacturers. This group needs profound knowledge of an position indicator's necessary connections of a electronic display and its integration into a complete machinery.

INFORMATION

The DPA32 is only available as a replacement as a single unit for your respective machine.

Part no. 03403027DPA32

WARNING!

Insufficiently qualified personnel

Insufficiently qualified personnel cause personal injury, serious damage to machine or actuator.

- Configuration, commissioning, mounting and maintenance by trained expert personnel only.
- This personnel must be able to recognize danger that might arise from mechanical, electrical or electronicequipment.

Qualified Personnel

are persons who

- are familiar with the safety guidelines of the electrical and automation technologies when performing configuration tasks;
- are authorized to commission, earth and label circuits and devices/systems in accordance with the safety standards.

1.6 Basic safety information

DANGER OF EXPLOSION!

Do not use the electronic display in explosive zones.

Identification

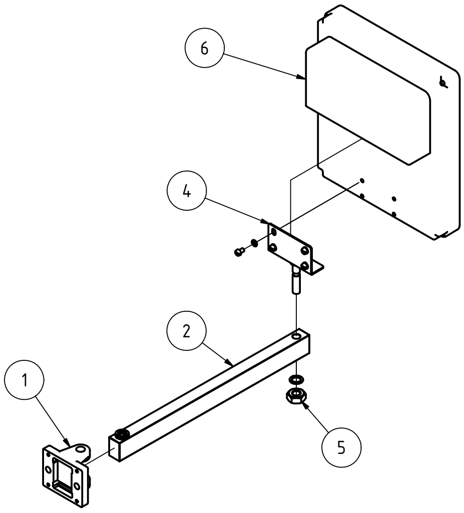
The rating plate shows the model name with model number and serial number.

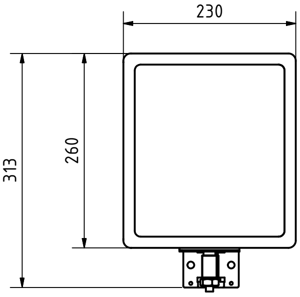
1.7 Dimensions and components

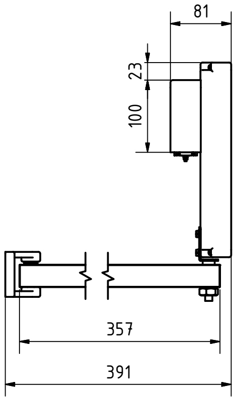
Assembly:

Screw the device in place on the fixture using the threaded holes (spacing 60 x 25mm - 4x M4, 7 deep) on the back.

1.8 Scope of delivery

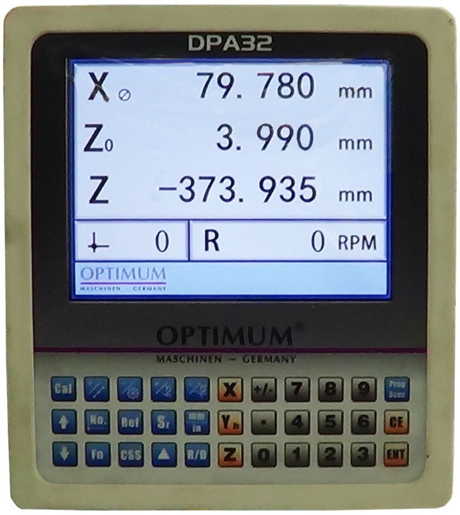






Pos.	Description	Qty.	Size	Item no.
1	Holder	1		
2	Strut	1	already installed in a similar way in the machine as delivered	
4	Holding plate	1		
5	Nut	1		
6	Digital position display	1		03403027DPA32
	External power supply unit	1	already installed in the machine in the as-delivered condition	
	RPM sensor	1	already installed in the machine in the as-delivered condition	

1.9 Operation DPA 32



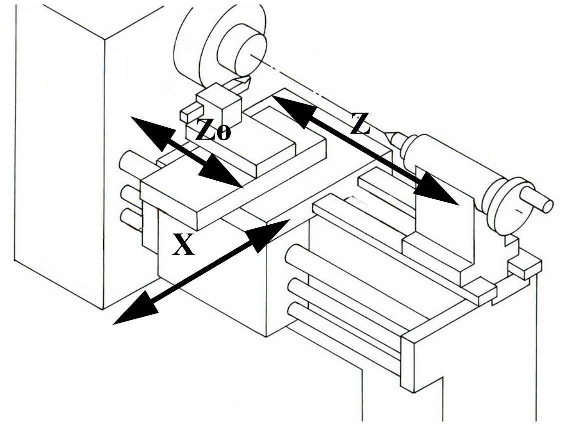
When the unit is switched on, the DRO starts a self-test.

After completion of the self-test, the DRO changes to the normal display state. The DRO displays the last data before switching off.

- The selected coordinates and the selected tool.
- The metric or Anglo-American system of measurement.
- The last values displayed.

1.9.1 Description of the Keys

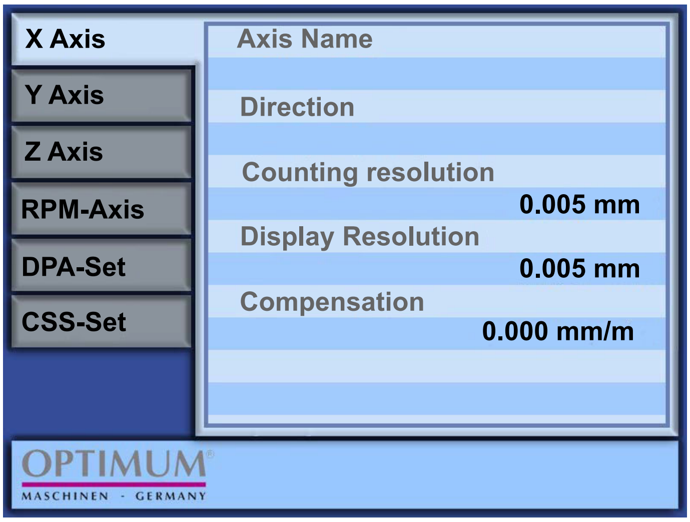
Letter/Symbol on the key	Name of the key	Function description
	X axis key	To select the X coordinate axis
	Y axis key Z_0 key	To select the Y coordinate axis, Z_0 - axis
	Z axis key	To select the Z coordinate axis
	Plus and minus signs with numerical keys and decimal point	For input of negative or positive signs. For numeric entry. For input of decimal places; decimal point
	Delete key	To clear displayed value of a specific axis or give up the current operation

ENT	Enter key	To confirm the data input
R/D	Radius or Diameter	X-axis display when used on lathes
mm in	Shift key Metric / inches	Display of values • in the metric system • in the Anglo-American measurement system
▲	Machine zero point	for setting an absolute zero-point in the coordinate system ☞ Machine zero point function on page 12
Sz	Z+ Z_0 key (3 axes)	For display of the Z+ Z_0 value Bed slide travel and top slide travel are added together. This function is only active if the Y-axis on lathes is set to Z_0 for the top slide, otherwise you only get a beep when you press the Sz key.
		
Prog 3sec	Programming key	For internal parameter settings ☞ CSS gear setting on page 20
Cal	Calculator function key	☞ Calculator function on page 13

+	- Addition	☞ Calculator function on page 13
−	- Subtraction	
×	- Multiplication	
÷	- Division	
	Coordinate points along a diagonal line	☞ Coordinate points along a diagonal line on page 14
	Coordinate points on a circle	☞ Coordinate points on a circle or arc on page 15
	Function of an inclined plane	
	Arc function	
No.	Tool data function	☞ Tool Data Function on page 13 ☞ Recall of tool data on page 13
↑ ↓	Arrow keys	Moves the cursor or changes the settings of the optional parameters.
Fn	FN key	Multiplex function key
CSS	Cutting speed CSS function	Start and stop of the constant cutting speed function. Parameter input when starting the function. ☞ CSS gear setting on page 20
		Can only be used in conjunction with speed-controlled lathes.

1.9.2 Parameterising the individual axes

- Press and hold Prog 3sec to access the parameter setting interface.
- Press the buttons ↑ ↓ to move the cursor » and select the corresponding parameter.
- To cancel an entry, press the key CE.
- Press the key ENT to save an entry.



Axis Name

Direction

Counting resolution
0.005 mm

Display Resolution
0.005 mm

Compensation
0.000 mm/m

Axis name:

Possible parameters: X | Y | Z | Z_0

The displayed axis name can be selected as X, Y, Z or Z_0 depending on the mounting position of the sensor.

Use the numeric buttons 2 and 4 to change the axis name.

Direction:

Negative or positive value in the direction of movement.

Selectable parameter: + | -

Use the numeric buttons 0 and 1 to change the direction of movement (counting direction).

Counting resolution:

Numerical parameter: The unit of the counting resolution of the sensor is 0.0001 mm; the actual resolution of the sensor used is entered here.

- old type, plastic: CSD203R Optimum magnetic tape with sensor (± 40 µ).
  Required setting of the counting resolution: 0.003mm
- new type, Metal casing: CSD205 Optimum magnetic tape with sensor (± 10 µ).
  Required setting of the counting resolution: 0.005mm
- Large Optimum ball measuring bars: Counting resolution 0.005mm
- Small, short ball measuring bars: Counting resolution 0.002mm

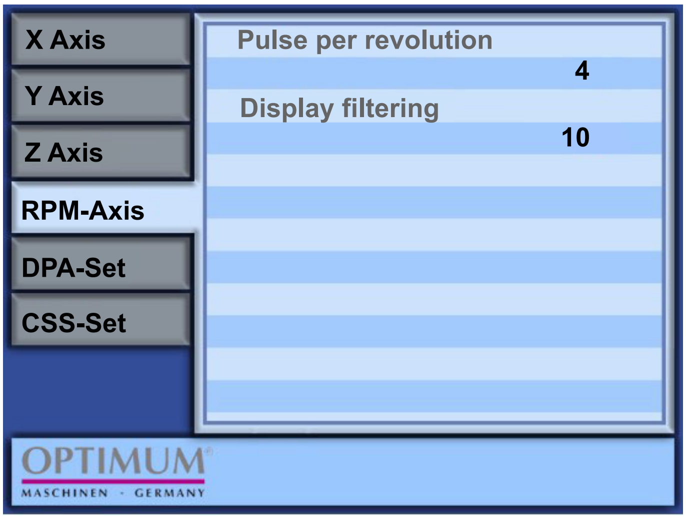
Display resolution:

Numerical parameter: Display unit whose value should be greater than the counting resolution of the sensor itself. A smaller value does not lead to a better display result or an actually better measurement result.

Compensation (Linear Compensation)

Numerical parameter: ± 99999.999 mm/m can be set here as linear length compensation per metre. The compensation value represents the compensation amount per metre of the corresponding axis.

1.9.3 Setting the spindle speed display



Pulse per revolution
4
Display filtering
10

RPM-Axis:

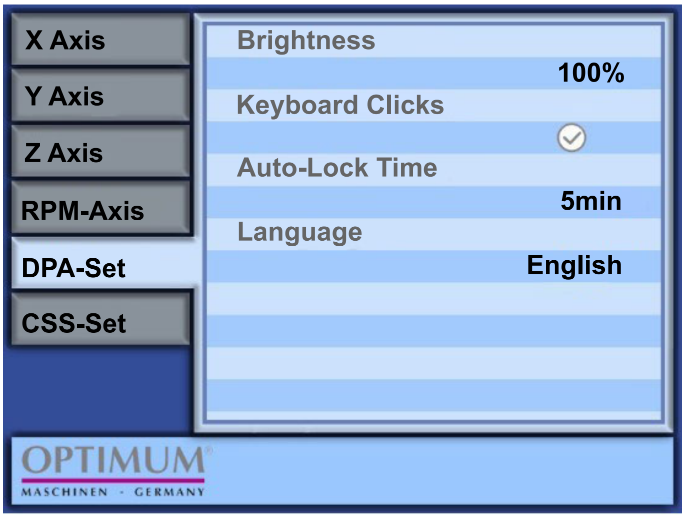
Numerical parameter: Number of transducer signals used per revolution.

The set value of the number of pulses per revolution of the speed signal. The number of pulses per revolution of the speed signal depends on the number of output pulses per revolution of the transducer used (i.e. the speed disc). The larger this value, the higher the resolution of the speed signal. The range of possible setting values extends from 1 to 99.

Display filtering:

This parameter can fix the display flickering caused by unstable speed.

1.9.4 DPA setting



Brightness
100%
Keyboard Clicks
✓
Auto-Lock Time
5min
Language
English

Brightness:

LCD display brightness setting (can be set between 20% - 100%).

Keyboard Clicks:

Keyboard playback sounds

Possible parameters: 0 | 1

Press the numeric key 0 ; 1 to switch the key tone on or off.

Auto-Lock Time:

Activating the screen saver

Numerical parameter: 0 to 999 minutes

If there is no position change in the 3-axis, no operation, the DPA will automatically reduce the brightness of the screen after the set time to protect the backlight of the screen and prolong the life of the screen. Press any key or move any coordinate to restore the display.

Language:

INFORMATION

Switching to another language is possible from serial number 1300200074.

Use the number keys to change the language.

- 0= English
- 1 = German
- 2 = French
- 3 = Spanish

1.9.5 Machine zero point function

For the setting of an absolute zero point.

Press the button ▲. The display shows ▲ flashing.

The axis values shown for the current machine position are reset to zero. Values for the axes may also be input where needed.

When the machine zero point is turned off, the previous values are shown again.

1.9.6 Calculator function

Add, subtract, multiply and divide.

- Press button **Cal** to start the calculator. The display shows + − × =. The number field of the rotation speed indicator is used as the input- and result field.
- To exit from the Calculator function, press the **Cal** button.

Keys

- **+** to add. **−** to subtract. **×** to multiply.
  ÷ to divide.

Example:

Press the following keys in the order shown in order to divide the number 46.2 by 2, and transfer the result to the Z axis.

Cal **4** **6** **•** **2** **÷** **2** **ENT** **Z**

1.9.7 Tool Data Function

Creates up to 99 tool data sets in relation in the coordinate system.

Usage of the tool data function makes it possible to establish a specific relationship between the tool data in the coordinate system and the displayed values.

INFORMATION

The Save function for tool data only works when the Reference Mark function is activated. ☞ Parameterising the individual axes on page 10.
Saved values remain even by loss of electric power.

Example:

Tool data no. 2 should lie at X = 1.000 and Y = 2.000 to the shown values.

Press the following keys in the order shown in order to input the values X = 1.000 and Y = 2.000 under tool data no. 2.

Ref **No.** **2** **ENT** **X** **1** **ENT** **Y Zo** **2** **ENT** **Ref**

1.9.8 Recall of tool data

Example:

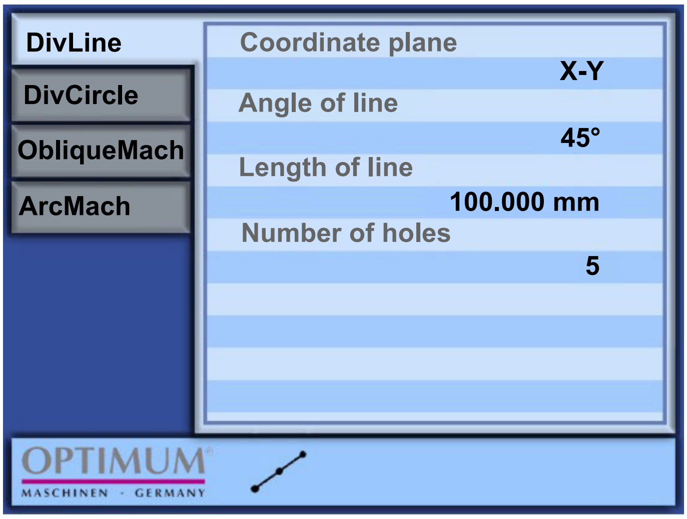
The tool data set no. 2 should be used at the currently displayed position.

Press the following keys in the order shown in order to use tool data set no. 2.

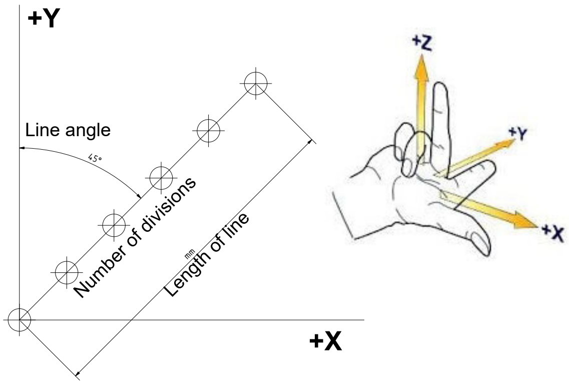
No. 2 ENT

1.9.9 Coordinate points along a diagonal line

Creates a line within a coordinate system along which a certain number of uniformly distributed coordinate points are defined.



Coordinate plane
X-Y
Angle of line
45°
Length of line
100.000 mm
Number of holes
5



Setting the parameters as required:

Coordinate plane:

Possible parameters: X-Y | X-Z | Y-Z

- Press the 1, 2 or 3 key to select X-Y, Y-Z or X-Z as the coordinate plane.

Angle of line:

The inclination between the line segment to be divided and the X axis in positive direction. (in the X-Y plane, an inclination between the line segment to be divided and the Y-axis in positive direction);

- Enter the angle of the line using the number keys and confirm with the key ENT.

Length of the line:

The length of the line segment to be divided evenly.

- Enter the the length using the numeric keys and confirm with the key ENT.

Number of holes:

The number of points to be evenly divided in the line segment.

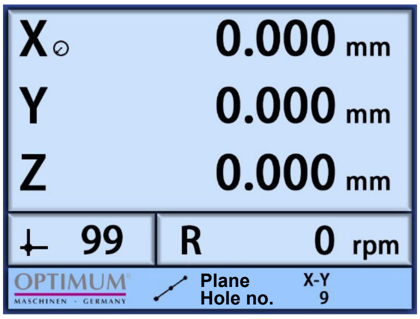
(n points to divide the line segment evenly into n-1 segments).

- Enter the number of the holes using the numeric keys and confirm with the key ENT.

Procedure:

- First move the machine tool to align the first point of the drill hole with the oblique line.
- Press the key to access the parameter settings. Press the key again to exit the parameter settings or function.
- Use the arrow keys to select the menu item and enter the desired value.
- Press the key Prog 3sec to execute the function.

Parameter: The display shows:


X 0.000 mm
Y 0.000 mm
Z 0.000 mm
99 R 0 rpm
Plane X-Y
Hole no. 9

- Press the key ENT to query the individual coordinate points.

Positioning to coordinate points:

- Press the key ENT to select the desired coordinate point.
- Travel the machine axes until the positions of the selected coordinate axes are 0.000.

INFORMATION

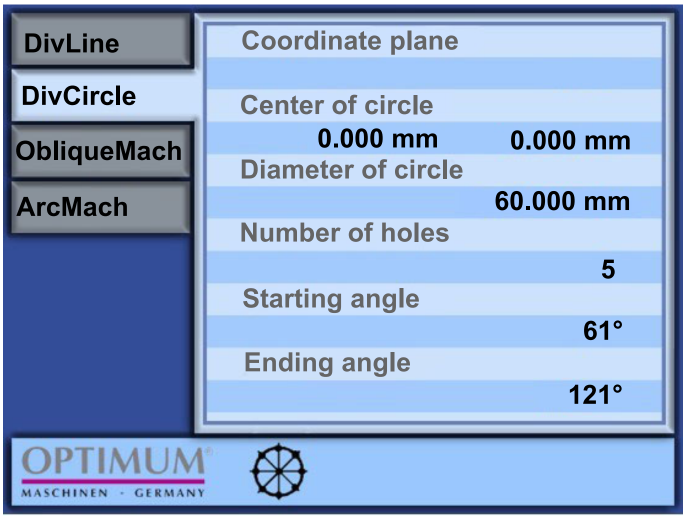
Press the key 0 to temporarily interrupt the function. The display returns to normal. Press the key 0 again to continue with the function.

1.9.10 Coordinate points on a circle or arc

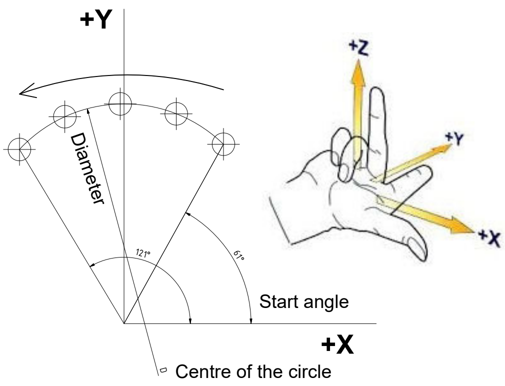
Function: Creates a circle or arc within a coordinate system along which a certain number of uniformly distributed coordinate points are defined. The defined coordinate points on the circle or arc run counterclockwise. Coordinate point 2 is located counterclockwise from coordinate point 1.

INFORMATION

Enter 360° to define a full circle. Enter a value of less than 360° to define an arc.



Coordinate plane
Center of circle
0.000 mm 0.000 mm
Diameter of circle
60.000 mm
Number of holes
5
Starting angle
61°
Ending angle
121°



Setting the parameters in sequence as required.

Coordinate plane:

Possible parameters: X-Y | X-Z | Y-Z

- Press the 1, 2 or 3 key to select X-Y, Y-Z or X-Z as the coordinate plane.

Center of circle:

The coordinate for the centre of the arc or the centre of the circle.

- Enter the centre of the arc in the coordinate plane using the numeric keys and confirm with the key ENT .

Diameter of circle:

The diameter of the arc or circle on which coordinate points are to be evenly divided.

- Enter the centre of the arc or circle in the coordinate plane using the numeric keys and confirm with the key ENT .

Number of holes:

The number of points that evenly divide the arc or circle. n points divide an arc section into n-1 segments.

- Enter the number of coordinate points using the numeric keys and confirm with the key ENT .

Starting angle:

Angle of the starting point of the arc or circle to be evenly divided.

- Enter the starting angle on the coordinate plane with the numeric keys and confirm with the key ENT .

Ending angle:

Angle of the end point of the arc or circle to be divided evenly.

- Enter the end angle on the coordinate plane with the numeric keys and confirm with the key ENT .

INFORMATION

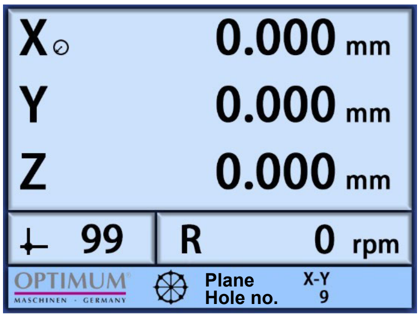
The angles of the start and end points of the arc are all calculated counterclockwise. In the X-Y or X-Z plane, the positive direction of the X axis is assumed to be the direction of 0 degrees and the positive direction of another axis is assumed to be the direction of 90 degrees; in the Y-Z plane, the positive direction of the Y axis is assumed to be the direction of 0 degrees and the positive direction of the Z axis is assumed to be the direction of 90 degrees.

Procedure:

- First move the machine tool to align the first machining point.

- Press the key ⎈ to access the parameter settings. Press the key again to exit the menu or function.
- Use the arrow keys to select the menu item and enter the desired value.
- Press the key **Prog 3sec** to execute the function.

⎈ Parameter: The display shows:



X 0.000 mm
Y 0.000 mm
Z 0.000 mm
99 R 0 rpm
Plane X-Y
Hole no. 9

- Press the key **ENT** to query the individual coordinate points.

Positioning to coordinate points:

- Press the key **ENT** to select the desired coordinate point.
- Traverse the machine axes until the positions of the selected coordinate axes are 0.000.

INFORMATION

- Press the key **0** to temporarily interrupt the function. The display returns to normal.

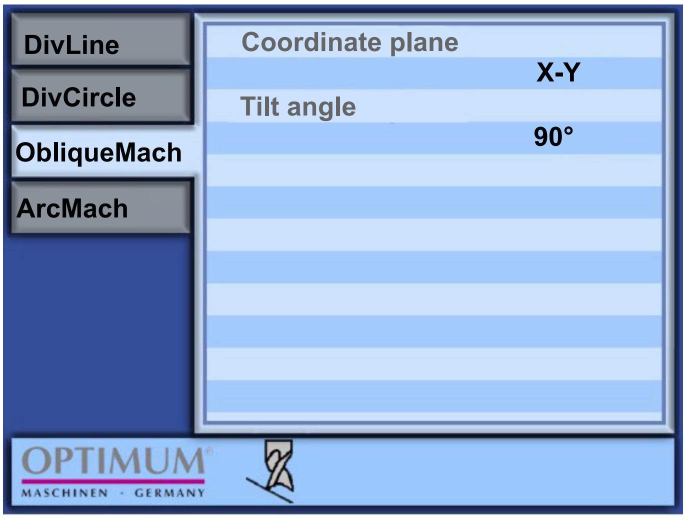
  Press the key **0** again to continue with the function.

1.9.11 Oblique line machining

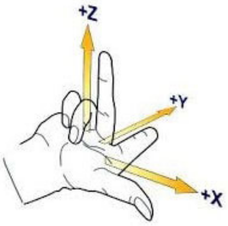
Function: Creates an inclined plane in a coordinate system so that machining operations can be performed on this inclined plane.

INFORMATION

Possibility of machining: In the machining state, the operator can move the first axis with the hand crank, which changes the value displayed by the first axis on the DRO. The operator can now move the second axis with the other hand to ensure that the value displayed by the second axis of the DRO approaches zero so that the tool moves along the inclined plane determined by the input angle.



Coordinate plane X-Y
Tilt angle 90°



Setting the parameters in sequence as required.

Coordinate plane:

Possible parameters: X-Y | X-Z | Y-Z

- Press the 1, 2 or 3 key to select X-Y, Y-Z or X-Z as the coordinate plane.

Inclined angle:

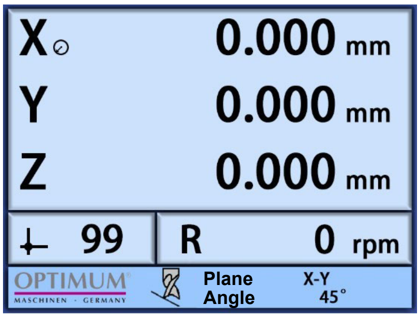
The inclination of the plane in the X-axis in the positive direction (in the Y-Z plane, an inclination between the plane and the Y-axis in the positive direction).

- Enter the angle of the inclined plane using the numeric keys and confirm with the key. ENT .

Procedure

- First move the machine tool to align the first machining point.
- Press the key to access the parameter settings. Press the key again to exit the menu or function.
- Use the arrow keys to select the menu item and enter the desired value.
- Press the key Prog 3sec to execute the function.

Parameter: The display shows:



Plane X-Y
Angle 45°

Positioning on a coordinate point on the inclined plane:

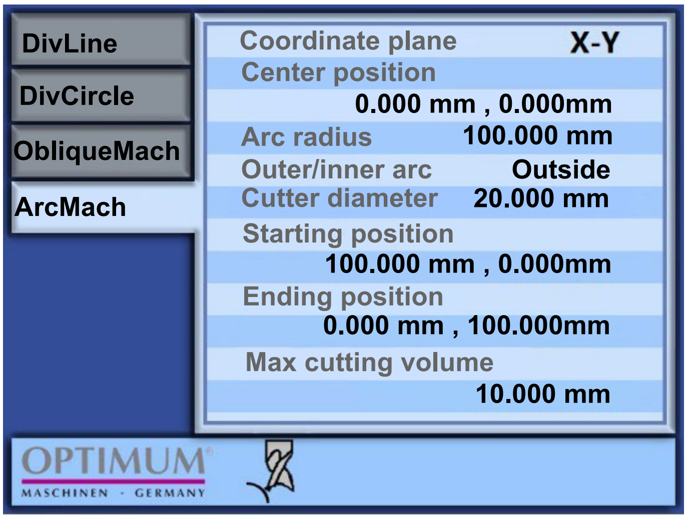
- Traverse the axes of the machine until the positions of the selected coordinate plane are 0.000.

INFORMATION

- Press the key 0 to temporarily interrupt the function. The display returns to normal. Press the key 0 again to continue with the function.

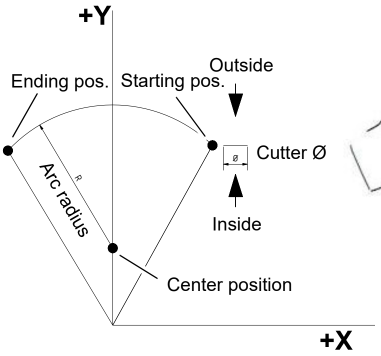
1.9.12 Arc machining

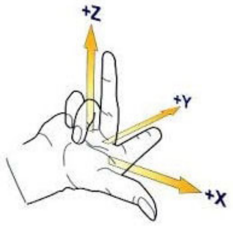
Function: Creates an arc in a coordinate system so that machining operations can be performed on this arc.



DivLine
DivCircle
ObliqueMach
ArcMach

Coordinate plane X-Y
Center position
0.000 mm , 0.000mm
Arc radius 100.000 mm
Outer/inner arc Outside
Cutter diameter 20.000 mm
Starting position
100.000 mm , 0.000mm
Ending position
0.000 mm , 100.000mm
Max cutting volume
10.000 mm





Setting the parameters in sequence as required.

Coordinate plane:

Possible parameters: X-Y | X-Z | Y-Z

- Press the 1 , 2 or 3 key to select X-Y, Y-Z or X-Z as the coordinate plane.

Center position:

Coordinate of the centre of the arc.

- Enter the centre of the arc in the coordinate plane using the numeric keys and confirm with the key ENT .

Arc radius:

The diameter of the arc.

- Enter the radius of the arc with the numeric keys and confirm with the key ENT .

Outer/inner arc:

Machining type for the arc. The processing on the arc should be inside or outside.

- Set the type of arc processing with the numeric keys 0 or 1 and confirm with the key ENT .

0 = Machining of the arc from the inside.
1 = Machining of the arc from the outside.

Cutter diameter:

The diameter of the tool (cutter) for machining on the arc.

- Enter the diameter of the milling tool using the numeric keys and confirm with the key ENT .

Starting position:

Coordinates of the starting point of the arc to be processed.

- Enter the start position of the arc on the selected coordinate plane with the numeric keys and confirm with the key ENT.

Ending position:

Coordinates of the end point of the arc to be processed.

- Enter the end position of the arc on the selected coordinate plane with the numeric keys and confirm with the key ENT.

Max cutting volume:

Maximum permissible machining depth for each machining operation.

- Enter the machining depth using the numeric keys and confirm with the key ENT.

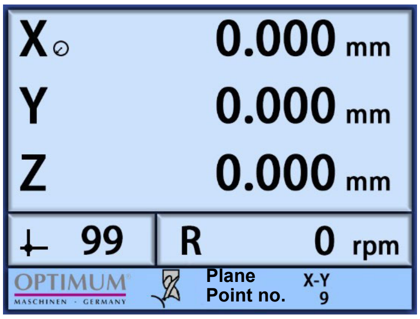
Procedure

- First move the machine tool to align the first machining point.
- Press the key to access the parameter settings. Press the key again to exit the menu or function.
- Use the arrow keys to select the menu item and enter the desired value.
- Press the key Prog 3sec to execute the function.

Parameter: The display shows:

Positioning on a coordinate point on the arc:

- The coordinates of the first point of the coordinate plane are displayed. Traverse the axes of the machine until the positions on the selected coordinate plane indicate 0.000.
- Press the key ENT to display the second point on the coordinate plane. Traverse the axes of the machine until the positions on the selected coordinate plane show 0.000. Repeat these steps until the arc is completely finished.



X 0.000 mm
Y 0.000 mm
Z 0.000 mm
99 R 0 rpm
Plane X-Y
Point no. 9

INFORMATION

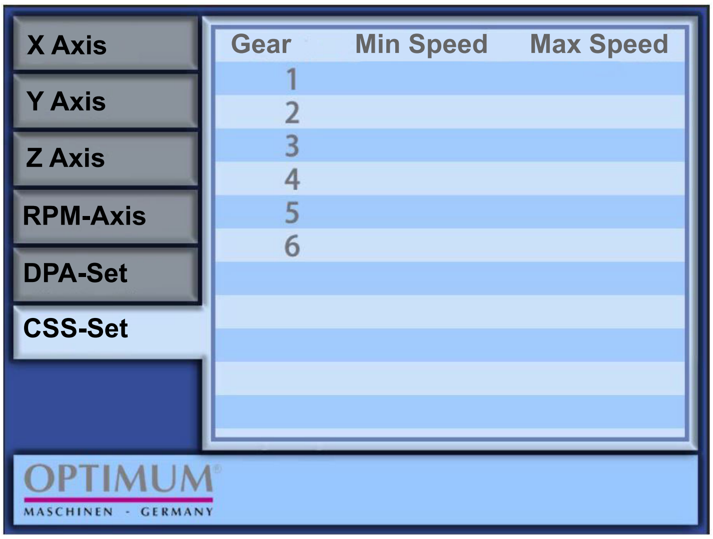
- Press the key 0 to temporarily interrupt the function. The display returns to normal.

Press the key 0 again to continue with the function.

1.9.13 CSS gear setting

INFORMATION

Can only be used in conjunction with speed-controlled lathes.



Gear	Min Speed	Max Speed
1		
2		
3		
4		
5		
6		

According to the gear labelling on the lathe, the maximum and minimum speed of 6 gears is set for the CSS function calculation. This means that the actual speed matches the spindle when the 0V - and 10V analogue values control the output frequency of the frequency inverter.

1.10 Change information operating manual

Chapter	Short summary	new version number
Operation	Reference marker deactivated, reference function removed	1.2
1.9.2 ; 3	Setting the axis parameters for different magnetic sensors ; Description of sensors	1.3
1.9.2	Buttons for changing the axis designation and counting direction	1.3.1
	Resolution for small, short MSSR linear encoders	1.3.2

2 Constant cutting speed - CSS function

CAUTION!

Uncontrolled release of the workpiece from the lathe chuck. As the speed increases, the centrifugal force on the chuck jaws increases. This reduces the effective clamping force of the workpiece in the lathe chuck.

Only use lathe chucks that correspond to the maximum possible speed of the lathe.

Make sure that the workpiece is firmly clamped in the lathe chuck at the maximum possible clamping force when using the constant cutting speed.

INFORMATION

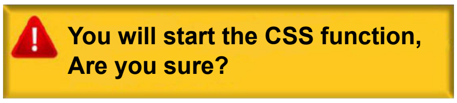
Can only be used in conjunction with speed-controlled lathes.

In conjunction with electronically controllable drives on manual lathes, the constant cutting speed enables the cutting speed of the turning tool to remain constant as the diameter of the workpiece increases or decreases. The speed is therefore adapted to the current diameter of the workpiece. The smaller the current diameter of the workpiece, the higher the speed should be.

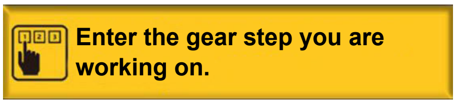
The constant cutting speed is preferably used for facing large-surface parts. By using the constant cutting speed, a constant turning pattern and a uniform surface quality on workpieces is possible.

2.1 Activating the constant cutting speed

- Press the CSS key to call up the CSS function. Press the **CE** button to exit and the **ENT** button to confirm the entry according to the prompt.

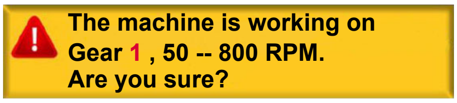

You will start the CSS function,
Are you sure?

- Enter the gear level in which you are working. (You must set the maximum and minimum speed of each stage in advance).

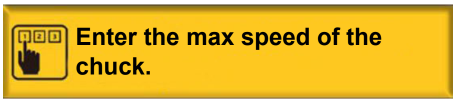

Enter the gear step you are working on.

- Confirm whether the entered stage and the corresponding speed range are correct.

  Press the key **CE** to return and press the key **ENT** to continue entering.

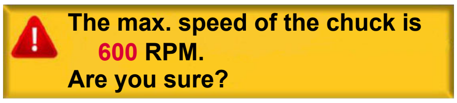

The machine is working on
Gear 1 , 50 -- 800 RPM.
Are you sure?

- Entry of the maximum speed of the chuck.

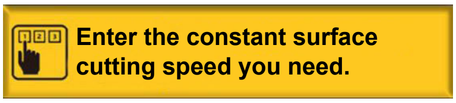

Enter the max speed of the chuck.

- Confirm whether the maximum speed of the lathe chuck is correct.

  Press the key **CE** to return and press the key **ENT** to continue entering.

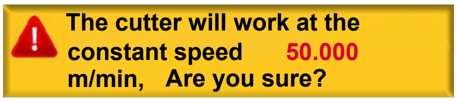

The max. speed of the chuck is 600 RPM. Are you sure?

- Entry of the desired constant cutting speed. (Unit: m/min)

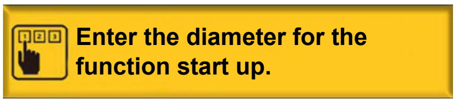

Enter the constant surface cutting speed you need.

- Confirm that the constant cutting speed entered is correct.

  Press the key **CE** to return and press the key **ENT** to continue entering.

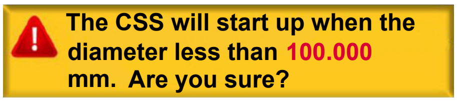

The cutter will work at the constant speed 50.000 m/min, Are you sure?

- Entry of the maximum switch-on diameter. (Unit: mm)


Enter the diameter for the function start up.

- Confirm whether the maximum start diameter entry is correct.

  Press the key **CE** to return and press the key **ENT** to continue entering.


The CSS will start up when the diameter less than 100.000 mm. Are you sure?

Start the CSS function.

INFORMATION

The CSS function is only activated when the display is switched to diameter.

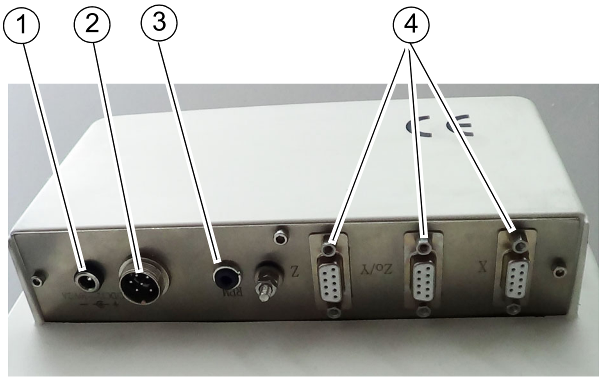
R/D

The DPA32 then disables potentiometer control for spindle speed, but instead calculates the required spindle speed based on the X-axis value and the setting parameters, and finally outputs the analogue quantity for spindle speed control.

Note: The R symbol for the speed indicator flashes after the CSS function has been activated. Press the CSS button to exit the CSS function at any time and to restore potentiometer control for spindle speed. If you call up the CSS function again, the parameters must be confirmed again and re-entered if necessary. The spindle speed is controlled again via the potentiometer after switching off the DRO.

2.2 DPA32 connection description

Basically, all connections are protected against external interference. Choose a place of operation that excludes inductive or capacitive interference influences on the electronic display or its connecting lines. When mounting the system keep a maximum possible distance from lines loaded with interference. If necessary, provide additional installations including screening shields or metallized housings. Contactor coils must be wired with spark suppression.



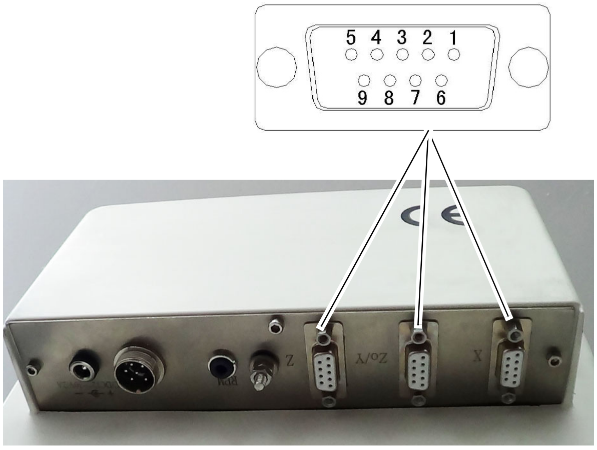
1	Power supply connection DPA32
2	Control signal constant cutting speed
3	Power supply speed sensor
4	Connection of travel measurement signals

	Working temperature	0 °C ... +40 °C
	Storage temperature	-30 °C ... +70 °C
	Humidity	90 % at 20°C + - 5°C maximum
	Protection type	IP51
	Weight	2.5 kg
	Electrical data:	
	Power supply Power supply unit	12 V to 30 V DC 230V
	Current consumption	~ 20W

2.2.1 Pinning of the reading signal connectors

INFORMATION

The digital position indicator is intended for operation with encoders that supply a TTL differential signal (TTL square wave) or a magnetic grid signal and a spherical grid signal.

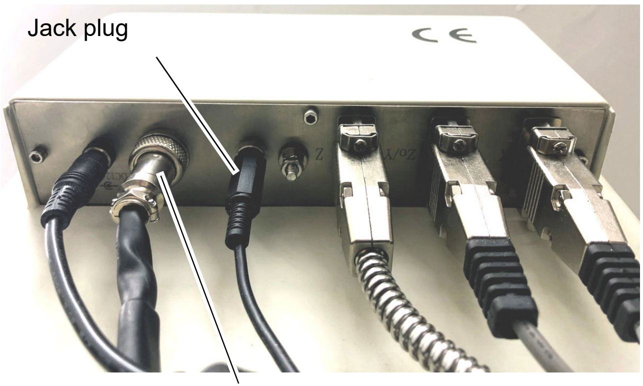


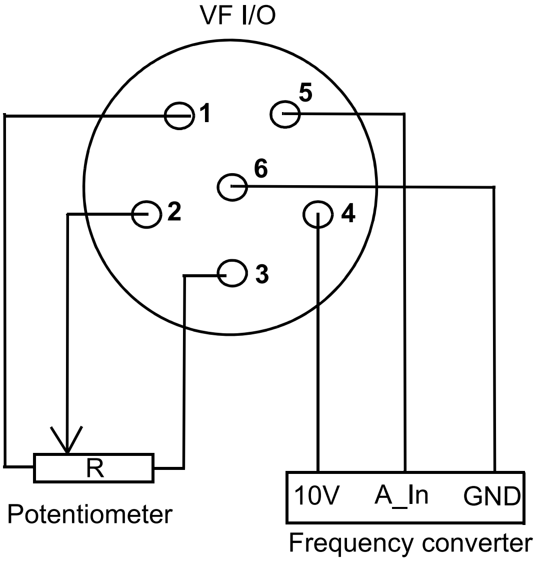
PIN No.	1	2	3	4	5	6	7	8	9	Housing
TTL differential signal for ML glass scales and active read head for magnetic strips	Z+	B-	not in use	B+	0V	Selection signal +	A-	A+	+5V	Shielding
Spherical grid signal for spherical scales	E+	S	+12V	E-	0V	not in use	not in use	not in use	not in use	Shielding

Note (selection signal +): The DPA32 can automatically identify the signal types based on this selection signal.

2.2.2 Analogue output interface VF I/O for spindle speed control

The sensor for speed measurement from the scope of delivery of the electronic display must be connected for this. Power is supplied via the rear jack plug.





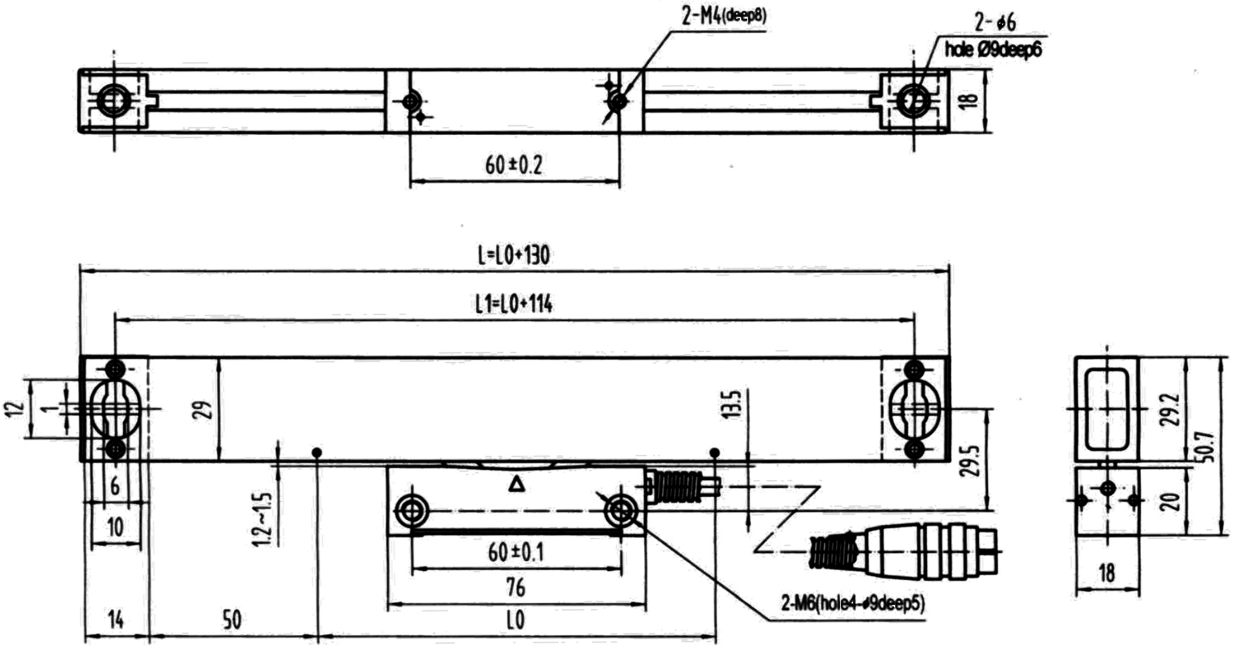
Pin No.	1	2	3	4	5	6
Signal	10V	A_In	GND	10V	A_Out (0-10V)	GND

When the CSS function is started, the digital indicator outputs an analogue 0-10 V signal to control the spindle speed.

When the CSS function is off, the potentiometer signal controls the spindle speed.

3 ML Measuring bars - Dimensions

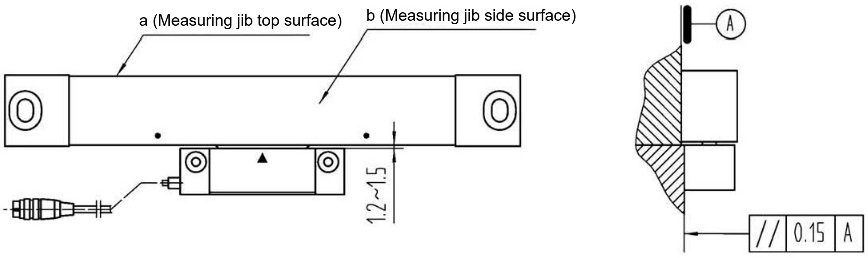
Measuring length L_0 (mm)	50 ~ 500mm
Mounting length L_1 (mm)	$L_1 = L_0 + 2\ (50+7) = L_0 + 114$
Total length L (mm)	$L = L_0 + 2\ (50+15) = L_0 + 130$



Type: MLxx Read head - Resolution 0.005mm (Counting resolution). Analogue output signal.

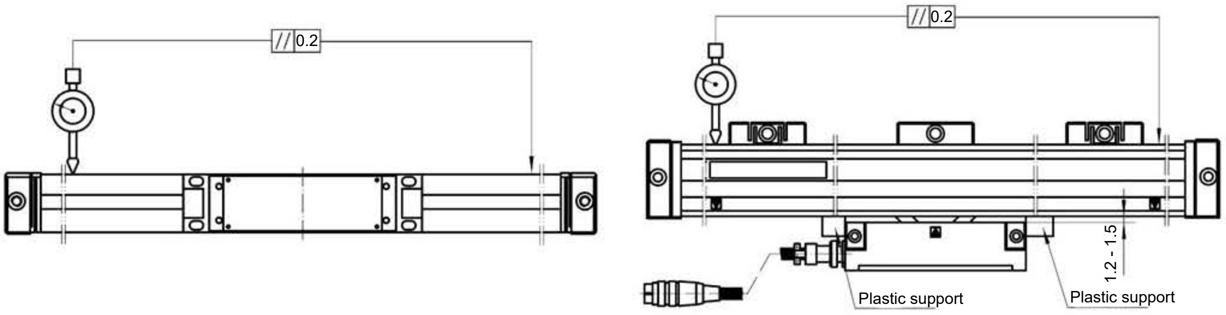
Type: MLxxR Read head - Resolution 0.001mm (Counting resolution). Analogue output signal. Used on the X-axis of grinding machines.

The measuring jib and sensor head are to be mounted separately on parts of the machine which are movable in relation to one another. The fixed and movable parts of the machine must correspond to the requirements and maximum tolerances as given in ☞ Img. 3-1: .



Img. 3-1:

- ➜ Alignment of the reading head. The parallel error between the orthogonal side surfaces of the measuring jib and the machine-tool guide must be less than 0.2mm across the entire range. ☞
- ➜ The maximum gap between the two parallel surfaces of the measuring jib and the sensor head is 1.2 to 1.5mm.



Img. 3-2:

3.0.1 Trouble shooting

Typical errors that occur during operation:

- The value shown on the display does not correspond to the actual value because the parameter setting for the counting resolution is set improperly.
- Reading head is incorrectly connected. Check the connection.
- The gap tolerance between measuring head and measuring jib was not maintained across the entire measurement range.
- Cable interruption / cut by sharp edges / cable squeezed.
- Moisture has penetrated extension cable plugs.
- Travel speed is too high; it should not exceed 0.5 meters per second.
- The replacement measuring jib is not from the same manufacturer as the original measuring jib. The actual counting resolution of the measuring jib does not correspond to the set value.

4 Magnetic sensor and magnetic tape

INFORMATION

At the time of writing, there are 2 different magnetic sensors.

- CSD203R Sensor (± 40 µ).
- CSD205 Sensor (± 10 µ).

The difference lies mainly in the improved shielding of the CSD205, its associated metal-shielded signal cable and the counting resolution of both types to be entered in the digital display.

Counting Resolution:

CSD203R Sensor: 0.003

CSD205 Sensor: 0.005

4.1 Mechanical installation

The installation may only be carried out in accordance with the specified IP protection class. The system must - if necessary - be additionally protected against harmful environmental influences, e.g. splash water, solvents, dust, impacts, vibrations, strong temperature fluctuations.

4.2 Mounting magnetic tape

The mounting must be flat to the mounting surface or the section to be measured. Ripples always deteriorate the measurement accuracy.

For technical reasons, an allowance of 30mm must be taken into account for the length in relation to the measuring section.

ATTENTION!

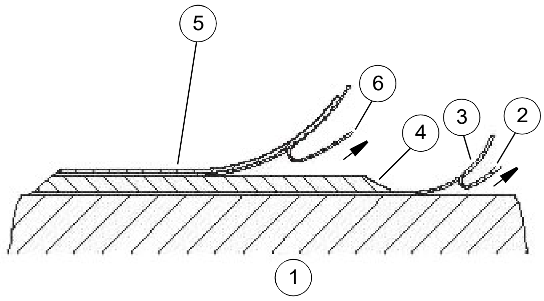
In order to achieve optimal adhesion, all anti-adhesive foreign substances (oil, grease, dust, etc.) must be removed by cleaning agents that evaporate without leaving any residue. Suitable cleaning agents include ketones (acetone) or alcohols, which are offered as quick cleaners by the companies Loctite and 3M, among others. The surfaces to be bonded must be dry and bonded with the highest possible contact pressure. The optimal bonding temperature is between 20° and 30° Celsius in dry rooms.

INFORMATION

When taping long tapes, the protective film of the tape should be peeled off over a short section to fix the tape. This is followed by the alignment of the belt. Now the protective film can be pulled out sideways over the remaining length, while simultaneously pressing on the tape. (a wallpaper printing roller can be used as an aid)

4.2.1 Assembly steps

- Carefully clean the mounting surface (1).
- Remove the protective film (2) from the adhesive tape (3) on the magnetic tape.
- Stick on the magnetic tape (4).
- Clean the magnetic tape surface carefully.
- Remove protective foil (6) from adhesive tape on the cover strip (5).
- Fix cover strip (both ends should slightly overlap).
- Secure the overlapping ends of the cover against detachment



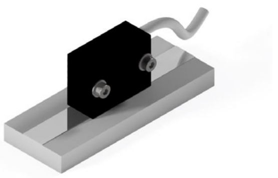
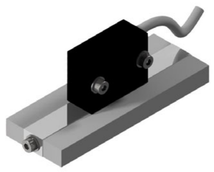
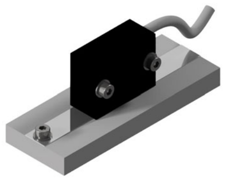
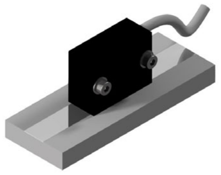
ATTENTION!

The influence of magnetic fields must be avoided. In particular, no magnetic fields (e.g. holding magnets or other permanent magnets) may come into direct contact with the magnetic tape. In de-energised state, movements or adjustments of the magnetic sensor are not detected and registered by the subsequent electronics.

4.2.2 Mounting examples

The simple mounting method, due to bevelled protective strip.
(☞ Img.4-1:) is only recommended in a very protected environment. There is a risk of peeling in unprotected environments. In such cases, mounting methods such as those shown in
☞ Img.4-2: and ☞ Img.4-3: are more suitable.

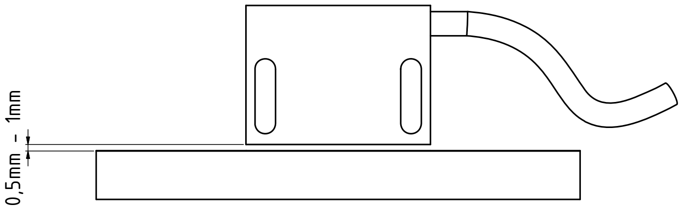
Optimum protection is provided by mounting in a groove
(☞ Img.4-4:) which should be deep enough for the magnetic tape to be completely embedded in it.

	
Img.4-1:	Img.4-2:
	
Img.4-3:	Img.4-4:

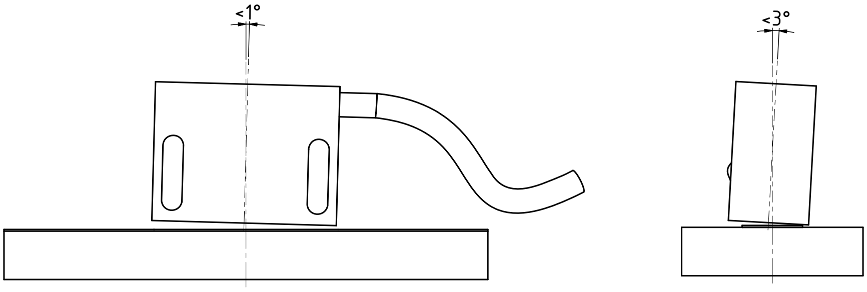
4.3 Mounting magnetic sensor

The magnetic sensor can be fixed by using two M3 screws. We recommend the use of washers.

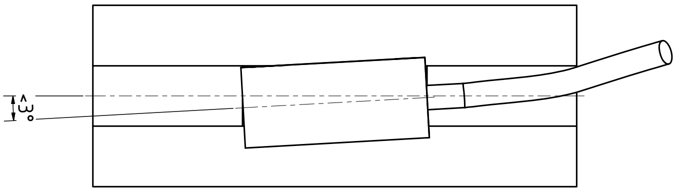
- Cables must be laid in such a way that there is no risk of damage from draught or other machine parts. If necessary, use a drag chain or protective hose and provide strain relief.
- Observe the distance between the sensor and the magnetic tape as well as the angle tolerances; these must be maintained over the entire measuring distance!
  (☞ Img. 4-5: to ☞ Img. 4-7:)
- The distance without masking tape is 0.5mm to 1mm. When using a masking tape, the effective distance is reduced by the thickness of the masking tape including the adhesive film. The sensor must not touch the magnetic tape.



Img. 4-5: Distance sensor / magnetic tape



Img. 4-6: Maximum misalignment



Img. 4-7: Alignment of the sensor

4.4 Counting resolution

The counting resolution of the magnetic tape sensor unit is 0.003mm or 0.005mm, depending on the type used. This must be entered at the corresponding position in the position display.

4.5 Electrical connection

Before switching on, check all line connections and plug connections.

4.5.1 Notes on interference immunity

All connections are protected against external interference. However, the place of use must be chosen in such a way that inductive or capacitive interference cannot affect the sensor or its connecting cable! Interference (e.g. from switch-mode power supplies, motors, clocked controllers or contactors) can be reduced by suitable cable routing and wiring.

4.5.2 Necessary measures

- The system must be installed at the greatest possible distance from lines that are subject to interference, - if necessary - **additional measures such as shielding plates or metallised enclosures** must be provided. Avoid routing cables parallel to power lines.
- Contactor coils must be wired with spark suppressors.

4.6 Maintenance

The surface of the magnetic tape should be cleaned from time to time with a soft cloth if it is very dirty due to dust, chips, moisture, etc.

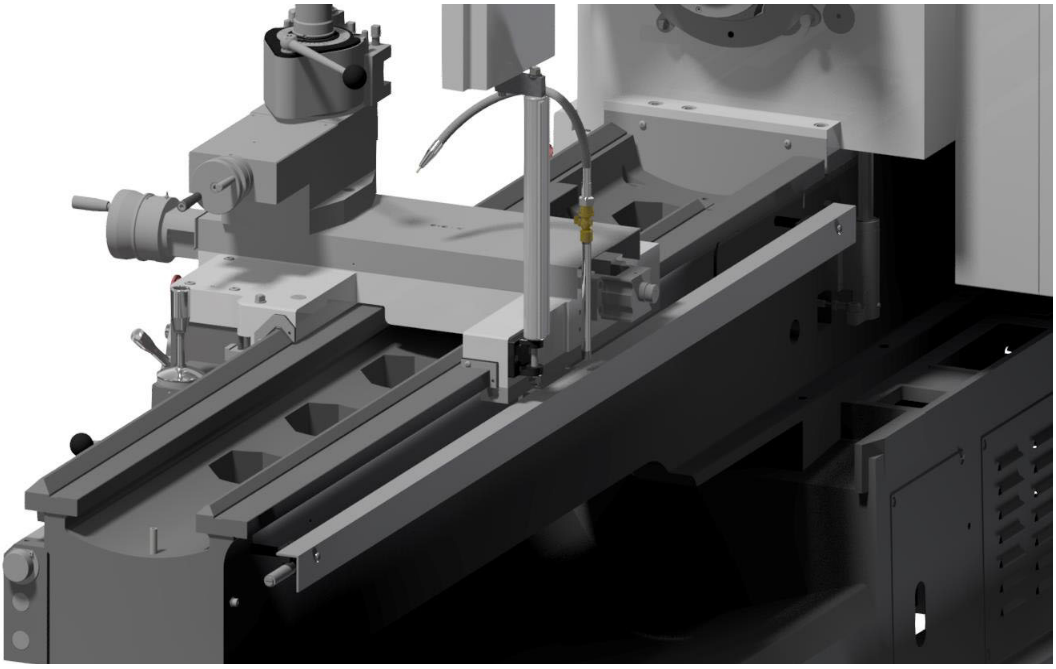
4.7 Error handling

The speed indicator fluctuates, jumps up and down, although the mechanical speed is constant.

Typical errors that occur during installation and operation:

- The magnetic tape was mounted incorrectly /active side down. ☞ Mounting magnetic tape on page 29
- The cover tape supplied was not used to protect the magnetic tape. The masking tape must not be magnetisable.
- The sensor is not connected correctly. Check connection.
- The distance tolerance between the sensor and the magnetic tape was not maintained over the entire measuring distance, the sensor grazes on the magnetic tape (☞ Img.4-5:).
- Cable interruption / disconnection due to sharp edges / crushing.
- The sensor is mounted with the active side facing away from the belt (☞ Img.4-7: and ☞ Img.4-7:).
- The sensor was not aligned accordingly ☞ Img.4-5: and ☞ Img.4-6:

5 MSSR Linear Encoder



Img. 5-1: MSSR Linear Encoder

INFORMATION

Large MSSR linear encoders are installed in places where there is sufficient space. This is the Z-axis on lathes, for example.

Small, short MSSR Linear Encoders are installed in places where space is limited. On lathes, for example, this is the X-axis and, if space permits, the top slide of the lathe.

5.1 Preparation

To reduce erroneous readings caused by machine wear, it is recommended that the scale will be mounted as close as possible to the machine lead screw or axis drive shaft.

If the scale holders are mounted facing outwards, the effective scale travel is extended for large MSSR by approx. 40mm. (☞ „Img. 5-1: MSSR Linear Encoder“ on page 33)

For the cable routing of the reading head, it should be taken into account that a longer effective measuring path results in the need for a longer cable.

The total length of the scale is different from the effective measuring distance.

(☞ „Img. 5-2: effective measuring path“ on page 34)

INFORMATION

At the time of writing, the standard cable length is 3 metres for large MSSR Linear Encoder for all effective measurement paths. Contact Sales or Purchasing if a different cable length is required instead of an extension cable. ☞ Waterproof terminal box for extension cables on page 39

(See table: effective measuring path)

Table: effective measuring path of large MSSR linear encoders

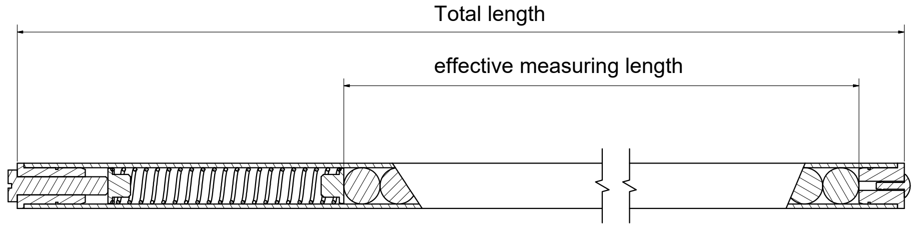
Total length (mm)	effective measuring length (mm)	Item no.
311	51	3384405
362	102	3384410
412	152	3384415
463	203	3384417
514	254	3384419
565	305	3384421

Table: effective measuring path of large MSSR linear encoders

Total length (mm)	effective measuring length (mm)	Item no.
616	356	3384422
666	406	3384423
717	457	3384424
766	506	3384425
819	559	3384426
870	610	3384427
920	660	3384428
971	711	3384429
1022	762	3384430
1073	813	3384431
1124	864	3384432
1174	914	3384433
1225	965	3384434
1276	1016	3384435
1378	1118	3384437
1428	1168	3384438
1479	1219	3384439
1530	1270	3384440
1581	1321	3384441
1632	1372	3384442
1682	1422	3384443
1733	1473	3384444
1784	1524	3384445
1886	1626	3384446
1987	1727	3384447
2089	1829	3384448
2190	1930	3384449
2292	2032	3384450
2394	2134	3384451
2495	2235	3384452
2597	2337	3384453
2698	2438	3384454
2800	2540	3384455
2902	2642	3384456
3003	2743	3384457
3105	2845	3384458
3206	2946	3384459
3308	3048	3384460

5.2 Effective measuring path of large MSSR Linear Encoder

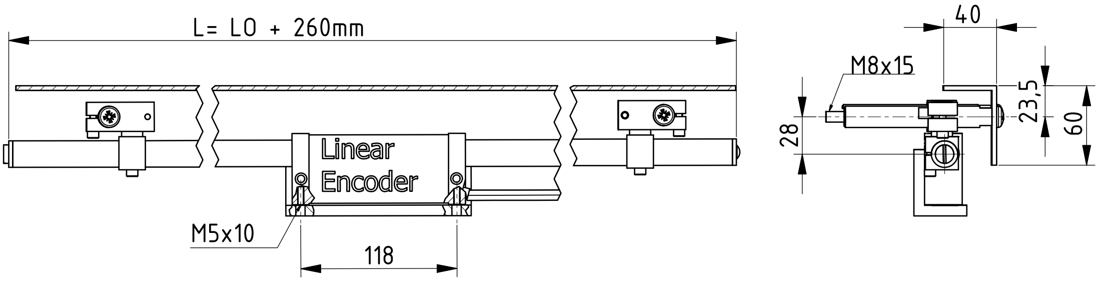
Due to the design of the scale, there is a difference between the actual total length and the effective measuring distance, i.e. the usable length.



Img.5-2: effective measuring path

5.3 Large transducer dimensions

Measuring length L0 (mm)	51-3048
Total length L (mm)	L = LO + 260



Img. 5-3: Dimension of the transducer

5.4 Warnings

If the machine travel is greater than the actual scale travel, it is recommended that mechanical stops are fitted to the machine to prevent damage from overrunning.

As the reading head and scale are precision components, it is important to handle them with care. Permanent damage can occur due to increased bending stress and hard impacts.

5.5 Technical data large MSSR Linear Encoder

Resolution/Accuracy	Standard: 0.005 mm
Signal output	Analogue
Cable length	Standard cable length 3 m
Resistance to impact	Linear encoder 100 g
Resistance to vibration	Linear encoder 30 g
Protection class	IP 67

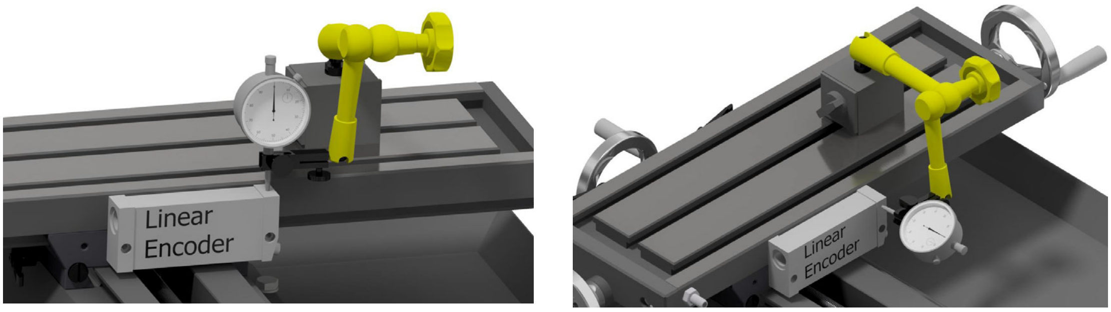
5.6 Technical data small, short MSSR Linear Encoder

Resolution/Accuracy	Standard: 0.002 mm
Signal output	Analogue
Protection class	IP 67

5.7 Installation

5.7.1 Installation of the reading head

The read head is attached to the machine together with the bracket and is to be fixed there parallel to the axis travel with a maximum deviation of +/-0.05mm. Use a suitable measuring device, e.g. dial gauge, to attach the reading head. Fine adjustments can be made by aligning and tightening the screws on the angle bracket.



Img.5-4: Installation of the reading head

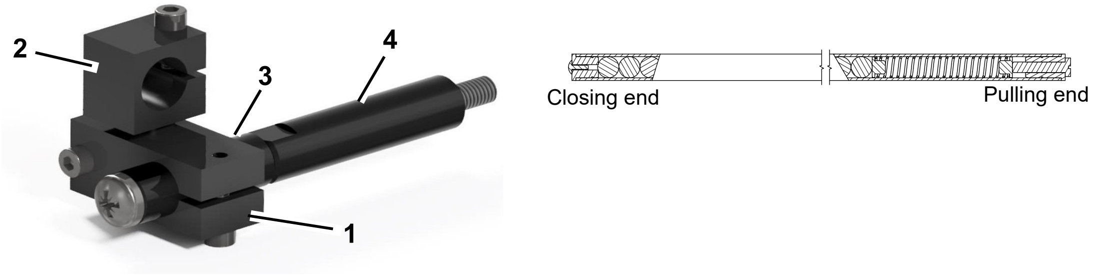
5.7.2 Installation of the scale

The two ends of the scale are different. The tension end is on the flat-head screw, the clamped end can be seen on the half-round rivet.

INFORMATION

1. Faulty readings result when the reading head moves beyond the effective measuring range limits.
2. The pretension of the balls is set at the factory via the grub screw at the end of the pull. The set screw must not be adjusted as this will change the calibration and accuracy of the scale.
3. When installing scales in the vertical plane, the train end should be at the top.

Once the reading head is attached and correctly aligned, the scale brackets can be attached.



Img.5-5: Scale holder and scale

No.	Designation	No.	Designation
1	Terminal block	3	short strut
2	Scale holder	4	long strut

Move the machine to its maximum position to the opposite side of the reader head. Maximum position means the full available travel, including winching by hand beyond any electrical limit switches or stops.

Carefully push the scale through the reading head, leaving a sufficient piece of the scale protruding from the reading head to allow the scale holders to be attached.

Fit the terminal block to the scale bracket, leaving a gap of about 3 mm between the lower edge of the bracket shoulder and the upper edge of the terminal block.

Slide the terminal block/holder assembly onto the scale to within about 5 mm of the end of the reader head.

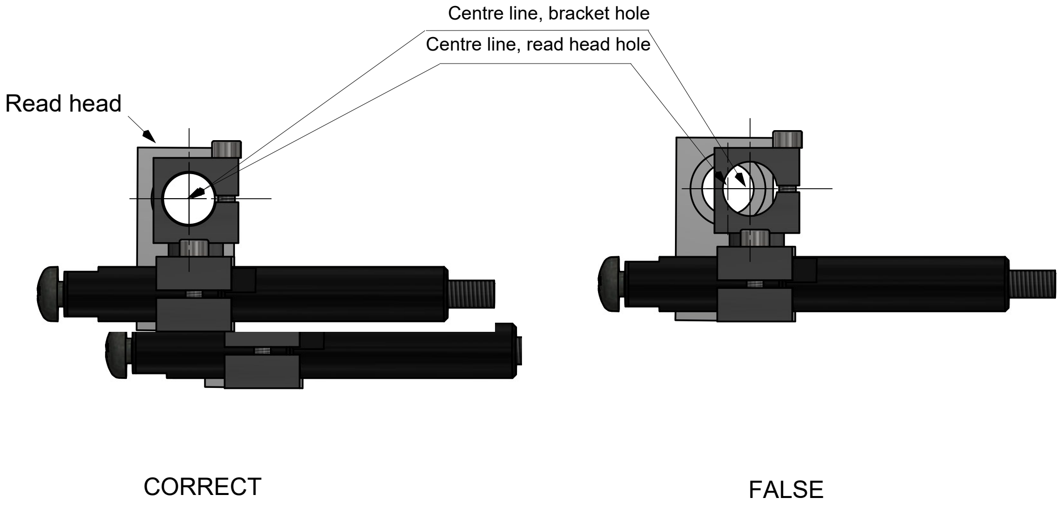
Grain the hole positions. It is important that the terminal block is kept right-angled to its mounting surface at all times.

Remove the terminal block/holder assembly and the scale from the reader head. Drill M8 x 18 mm deep into the machine casting and cut the thread. The strut should be square and flush with the machine surface.

A maximum of two struts can be screwed together to allow sufficient adjustment of the scale. If two struts are not enough to fix the scale, additional brackets are necessary. These holders must be stiff enough to prevent axial movement of the scale.

Place the terminal block/holder assembly loosely on the strut and pass the scale through the reading head and into the scale holder. Carefully slide the scale back and forth 25 - 50 mm through the scale holder while tightening the hexagonal screws on the terminal block. Make sure that the scale slides smoothly through the reading head and into the scale holder. If there is any interference, loosen the hexagonal screws on the terminal block completely and repeat this step.

The centre line hole of the reading head must be directly aligned with the centre line hole of the scale holder. Failure to observe this warning may result in permanent damage to the scale and/ or incorrect readings.



Img. 5-6: Bore alignment

Remove the scale from the reading head and move the machine to its full travel in the opposite direction . Full travel means winching by hand beyond the electric limit switches.

Fit the terminal block to the scale bracket, leaving a gap of about 3mm between the bottom edge of the bracket and the top edge of the terminal block.

Slide the terminal block/bracket assembly onto the scale, ensuring that there is sufficient clearance between the reader head and the terminal block to prevent damage to the reader head cable. Do not attach the scale holder to the scale yet.

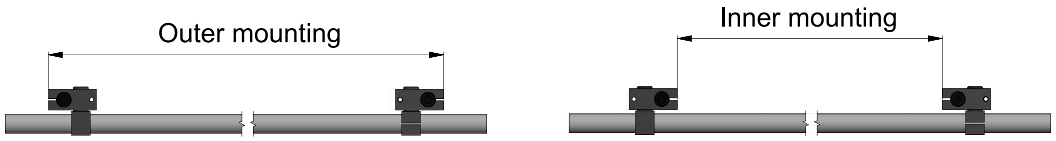
Centre punch through the connection block and into the machine casting. It is important that the terminal block is kept right-angled to its mounting surface at all times.

Remove the terminal block/holder assembly and the scale from the reader head. Drill M8 x 18 mm deep into the machine casting and cut thread as marked by the centre punch. Attach the struts to the machine casting. The strut should fit right-angled and be flush with the machine surface.

Place the terminal block/holder assembly loosely on the strut and pass the scale through the reading head and into the scale holder. Carefully slide the scale back and forth 25 - 50 mm through the scale holder while tightening the hexagonal screws on the terminal block. Make sure that the scale slides smoothly through the reading head and into the scale holder. If there is any interference, loosen the hexagonal screws on the terminal block completely and repeat this step.

Carefully slide the scale through the scale holder, the reading head and into the other scale holder. Fully tighten the hexagon screw of the scale holder at the clamped end of the scale, but only hand-tighten the hexagon screw at the tension end.

5.8 Mounting variants

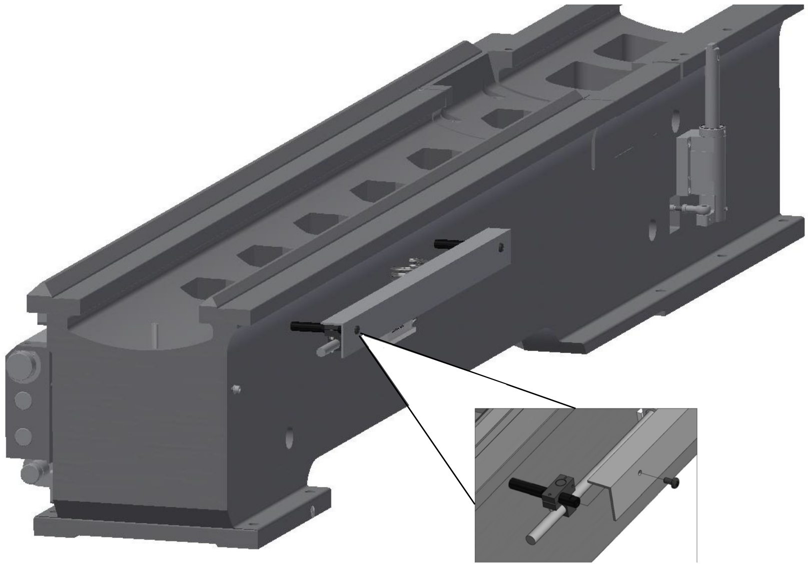


Img. 5-7: Mounting variants

5.9 Fastening the scale cover

Each transducer has a protective cover. This aluminium cover is designed to protect the scale from damage due to impact. The cover can be attached to the machine casting or via the scale struts.

To attach the cover to the struts, measure and mark the distance between the centre of each strut. Drill two 8.5mm dia. holes at each end of the cover. The cover can be attached to the struts using the enclosed half-round head screws. After the cover is attached, move the machine axis to both ends of the travel to ensure that the cover does not collide with or rub against the reader head.



Img. 5-8: Fastening the scale cover

5.10 Cable routing

The cable routing of the reading head is of crucial importance for the trouble-free functioning of the measuring transducer. Sagging and loose cables can get caught or break and cause irreparable damage. Make sure that the cables are attached to the machine carefully and at short intervals. If it is necessary to allow cable loops to protrude along the cable routing, for example as a compensating length at transitions between moving and rigid machine parts, these must not interfere with the movement of the machine or the movement of the transducer.

INFORMATION

The cable is an integral part of the scanning head. Should the cable become damaged, it must be replaced complete with the scanning head.

If cable extensions are required, the connection points must be provided with protective housings. (☞ „Img. 5-9: Protective housing for plug connection of the extension cable, article no. 033841ECB“ on page 39)

If extension cables are used, the plug and socket connection must not be in the chip tray or in the direct flow of coolant or oil. To avoid problems with noise or interference voltages, do not leave the cables over electric motors, fuse boxes or electric pumps.

5.10.1 Waterproof terminal box for extension cables

Img. 5-9: Protective housing for plug connection of the extension cable, article no. 033841ECB

5.11 Final inspection

Before commissioning the transducer, move the machine slowly to both ends of its travel. Check that the cables are secure and that no machine overflow can occur.

EC - Declaration of Conformity

according EMC Directive 2014/30/EC

The manufacturer / Distributor:
Optimum Maschinen Germany GmbH
Dr.-Robert-Pfleger-Str. 26
D - 96103 Hallstadt, Germany

hereby declares that the following product

Product designation: DRO

Type designation: DPA 32

Digital position indicator for use on machine tools for displacement measurement in conjunction with magnetic sensors, and/or linear encoders, which complies with all relevant provisions of the above-mentioned Directive 2014/30/EU - including its amendments in force at the time of declaration. The safety objective meet the requirement of the directive.

The following additional EU directives have been applied:

Restriction of the use of certain hazardous substances in electrical and electronic equipment 2015/863/EU

Responsible for documentation: Kilian Stürmer, phone: +49 (0) 951 96555 - 800

Address: Dr.-Robert-Pfleger-Str. 26, D - 96103 Hallstadt, Germany

Kilian Stürmer
(CEO, General Manager)
Hallstadt, 2023-05-23

6 Ersatzteile - Spare parts

6.1 Ersatzteilbestellung - *Ordering spare parts*

Bitte geben Sie folgendes an - *Please indicate the following :*

- Maschinenbezeichnung - *Machines name*
- Herstellungsdatum - *Date of manufacture*
- Artikelnummer - *Article no.*

Die Artikelnummer befindet sich in der Ersatzteilliste. *The article no. is located in the spare parts list.*

6.2 Hotline Ersatzteile - Spare parts Hotline

stürmer WELT DER MASCHINEN

☎

+49 (0) 951-96555 -118

ersatzteile@stuermer-maschinen.de

6.3 Service Hotline

stürmer WELT DER MASCHINEN

☎

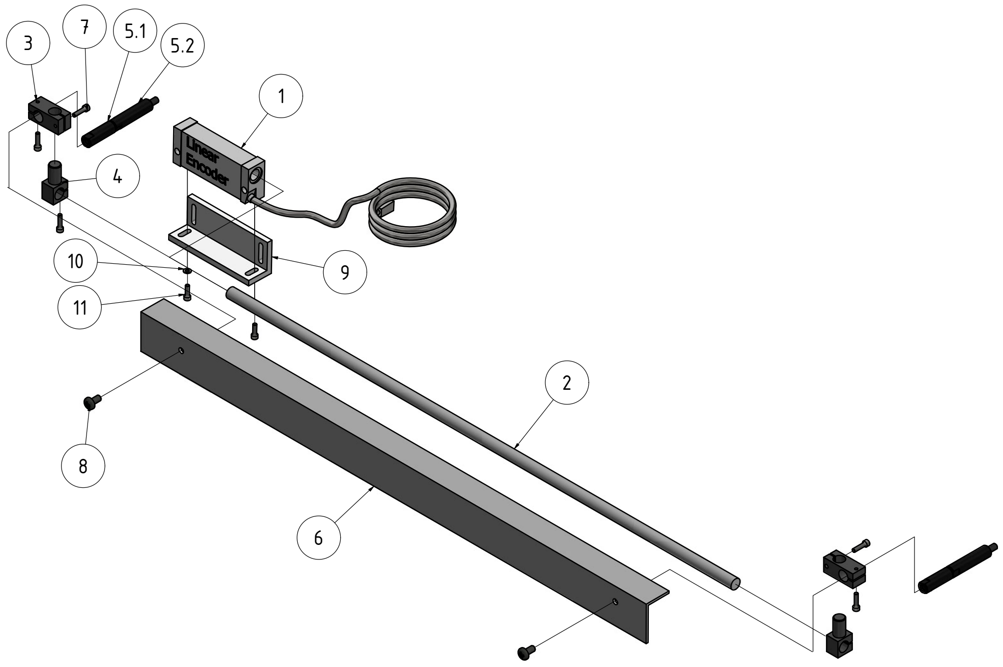
+49 (0) 951-96555 -100

service@stuermer-maschinen.de

6.4 Ersatzteilzeichnungen - Spare part drawings

6.5 MSSR Linear Encoder - Ersatzteilzeichnungen - Spare part drawings

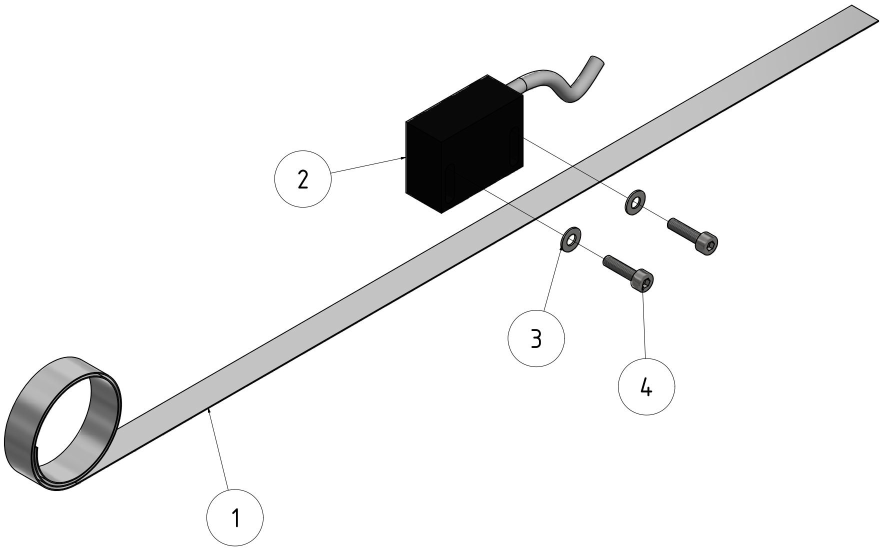
A Großer MSSR Messwandler - Large Linear encoder



Teileliste - Parts list					
Pos.	Bezeichnung	Description	Menge Qty.	Grösse Size	Artikelnummer Item no.
01	Lesekopf	Reading head	1		0338440501
02	Kugelmessleiste	Ball measuring bar	1	verschiedene Längen different lengths	
03	Anschlussblock zur Aufnahme von Maßstab und Vorrichtung	Connection block for holding scale and fixture	2		0338440503
04	Fester Block für Maßstab und Halterung	Fixed block for scale and holder	2		0338440504
05.1	Installationssäule für Maßstab (vorne)	Installation column for scale (front)	2		0338440505-1
05.2	Installationssäule für Maßstab (hinten)	Installation column for scale (rear)	2		0338440505-2
06	Abdeckplatte für Maßstab und Halterung	Cover plate for scale and holder	1	verschiedene Längen different lengths	
07	Schraube M5 x 20	Screw M5 x 20	6	DIN EN ISO 4762 M5 x 20	
08	Schraube M8 x 16	Screw M8 x 16	2	DIN EN ISO 7045 Z M8 x 16	
09	Winkelhalterung	Angle holder	1		0338440509
10	Beilegscheibe	Washer	2	DIN 988 S6	
11	Schraube M6 x 25	Screw M6 x 25	2	DIN EN ISO 4762 M6 x 25	

6.6 Bauteile Magnetsensor - Magnetic sensor components

A Magnetsensor - Magnetic sensor



Pos.	Bezeichnung	Description	Grösse Size	Katalog - Artikelnummer Catalogue - Item number
1	Magnetband, 2mm Magnetpolabstand 0,003 mm Zählwertauflösung mit 3384035	Magnetic strip, 2mm magnetic pole distance 0.003mm count resolution with 3384035	1100mm Katalogware 1100mm catalogue item	3383978
			Magnetband pro Meter, Katalogware Magnetic tape per metre, catalogue item	3383980
			2000mm Katalogware 2000mm catalogue item	3383979
2	Magnetsensor für Magnetband Aktiv-Lesekopf, Anschluss-Kabellänge 4 Meter 0,003 mm Zählwertauflösung	Magnetic sensor for magnetic strip Active reading head, connection cable length 4 metres 0.003mm count resolution	CSD203R	3384035
	Magnetsensor für Magnetband Aktiv-Lesekopf, Anschluss-Kabellänge 4 Meter 0,005 mm Zählwertauflösung	Magnetic sensor for magnetic strip Active reading head, connection cable length 4 metres 0.005mm count resolution	CSD205	3384035
3	Beilegscheibe	Washer	DIN EN ISO 7091	
4	Schraube M3x20	Screw M3x20	DIN EN ISO 4762	
	Verlängerungskabel für Sensor	Extension cable for sensor	1 Meter 1 metre	3384040